Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PAPERS IN *AGRICULTURE.*

N° I.

PEAT MOSS.

The GOLD MEDAL *of the Society was this Session presented to* ROBERT HALDANE BRADSHAW, *Esq. M. P. of Worsley Hall, near Manchester, for reclaiming* 294 *Acres of* PEAT MOSS.—*The following communication was received from him on the subject.*

Worsley Hall,
31st Oct. 1817.

SIR;

I TAKE the liberty of requesting that you will submit for the consideration of the Society of Arts, the following statement as applicable to the Premiums in Agriculture offered by them in 1817; trusting that on a review of the facts therein recited, I may be allowed to have some small claim to the distinguished honour awarded by Article 43, to such as shall have, to the satisfaction of the

Society, turned their attention to the Improvement of Waste Lands.

Towards the latter end of the year 1810, I purchased the Manor and Estate of Boothstown, situated within the township of Worsley, in the county palatine of Lancaster, and consisting of nine hundred and twenty statute acres, of which two hundred and ninety-four were rough and almost impassable moss, on an average six yards deep, very boggy, wholly uncultivated, and lying perfectly useless; its surface was covered with a coarse ling, and a variety of aquatic plants. Shortly after taking possession of this property, my attention was naturally directed to this unproductive portion of it, and thinking that the greater part, if not the whole, might be reclaimed and brought into a state of cultivation at a moderate expense, I determined on attempting it, and am now enabled to lay before the Society the successful result of my undertaking.

From the spongy nature of the moss, and the impossibility, in many places, of its bearing men, much less cattle, my first object was, to form and complete the roads delineated on the accompanying plan or map,* which I gradually effected in the following manner:—Two parallel drains, six feet wide at top, one at bottom, and three deep, were cut on each side of the intended line, which, on an average of the whole of the roads, may be set down as eleven yards wide; and the clods of moss taken out were used for the purpose of rounding them in the middle. This done, loppings and boughs, cropped from the trees and plantations near at hand, were placed crosswise upon the road, and a coat of rock, the refuse of brick kilns, and such other hard materials as could be procured, of about twelve inches in thickness, and four yards in breadth, was laid thereon from the centre each way, forming altogether a solid and excellent road. The expense was about eleven shillings per rod, and, as may be easily conceived, greatly facilitated the accomplishment of my ulterior views and intentions.

---

* This map remains in the possession of the Society.

The next thing done was, to cut drains, six feet wide at top, one at bottom, and three deep (executed by bargain, at the rate of 13½*d.* per lineal rod, including levelling the same), in the directions and manner shown in the plan before referred to; care being taken to obtain as much fall for the drainage water as possible, and which will account for the roads not running in parallel lines from the main one; as, under other circumstances, would have been perhaps more desirable.

I had already bored for and found marl in the lands adjoining; and on subsequently boring in the skirts of the moss itself, I was so fortunate as to discover considerable quantities, so situated as to afford great facility in the operation of marling. The pits on the west and north sides were first opened, and the work began from these several quarters simultaneously, by means of iron rail ways, which were previously laid down for the purpose of conveying the marl by waggons across the moss to the different parts thereof; the plan will demonstrate how much has been reclaimed from 1811, to the present period, as well as the proportions improved in each several year.

The whole may be comprised in four lots, under five heads of produce, potatoes, beans, oats, meadow land, and pasture for sheep and cattle; and as each has undergone a process varying but little in its nature from that adopted in lot 1, and planted with potatoes, perhaps it will be deemed sufficient to give the items of expense attending such process, in that instance only.

The contents of this lot are ten enclosures, which were marked in 1814 and 1816, and lay so until this spring, when they were dug and delved for potatoes; the whole expense of cultivation, from the beginning, and the produce of the present crop, being as under:

	£.	s.	d.
Push-ploughing the surface, burning the same, and levelling per acre	1	13	4
Marling with waggons, on a rail way (two waggons drawn by one horse) per acre . .	14	3	0
Delving in butts, each three yards wide, per acre	4	14	3
Dry scrapings of the streets, from Manchester, &c. for manuring when delving, and covering the potatoes when set, 100 tons per acre, at 3*s*. per ton	15	0	0
Potatoe-sets per acre, and setting the same .	12	7	6
Nicking out and opening the water ways between the butts, per acre	1	0	0
	£.48	18	1

The produce has been sold, and amounted to 19*l*. 10*s*. per acre.

It may here be necessary to observe, that the potatoes, when gathered, are sold to a large body of labourers, employed in these and other works, including very extensive collieries under my superintendence in the neighbourhood, and when the crops are got, great attention is paid in keeping up the manure, marl and soil, at the same time mixing up all well together with the moss brought up in delving.

I next beg leave to call the Society's attention to that part of the plan, named lot 2, and comprehending eight enclosures. These lands having undergone operations similar to the foregoing last year, produced a very fair crop of potatoes, and were last spring set with beans, at no greater expense than the following:

	£.	s.	d.
Seed beans per acre 2 bushels, at 8*s.* 6*d.* per bushel	0	17	0
Sitting with sticks per acre	0	10	0
Opening the water ways, between the butts (rendered necessary in consequence of two butts having been laid together, round in the middle, when the former crop of potatoes was gathered last autumn, and which continued in that state until the setting of beans in the spring) per acre	0	8	0
	£.1	15	0

The produce of the above crop has yielded 17*l.* 10*s.* per acre.

After the beans are reaped, hay seeds are sown on the stubble, which never fail to produce excellent grass the following year. This and a succeeding crop will go a great way towards balancing the deficiency, say 13*l.* 13*s.* 1*d.* per acre, on the produce of the former crops of potatoes and beans, if not altogether defray the whole expenses of improvement, without taking into consideration the increased value of the land, which, from being entirely useless and unprofitable, may even at the present moment, be fairly rated as worth 60*l.* per acre.

Another part of the moss deserving particular notice from the different mode of its being brought into cultivation is lot 3, comprising eight fields, which, although giving less profits in the first instance, leaves the land more in heart for succeeding years, as meadow or pasture, from one crop only having been taken. It was marled in 1814, and ploughed during the last Autumn and Spring for oats and clover, being manured with a set of street scrapings and soap waste; this method of course brings the land earlier into grass than the former one, and, from its better condition produces fuller crops of hay than when cultivated in the manner first described, and has been uniformly abundant. As the present, like that allotted to potatoes, is the first crop derived from the moss in its improved condition, every expense attending its improvement is here recapitulated.

	£.	s.	d.
Push-ploughing the surface, burning the same, levelling and marling per acre, as more fully particularized in lot 1	15	16	4
Compost of street scrapings and soap waste; 25 tons per acre, at 10*s*. per ton.	12	10	0
Ploughing three times, scuffling, harrowing, &c. twice, with horses on pattens . . .	6	10	0
Five bushels of seed oats, per acre	1	15	0
N.B. The price of oats has fallen considerably, since the above were bought.			
	£.36	11	4

Produce of oats 6*l*. per acre.

The remainder of the improved moss (excepting the part marled in 1817, which will be delved and set with potatoes next Spring) is either meadow or pasture, and now bears a remarkably fertile appearance, supplying excellent herbage for sheep, and light cattle, such as small Scots, which thrive well on it. The enclosures throughout lots 1, 2 and 3, as well as those of the meadow or pasture land, are substantially fenced and planted with forest trees and quicksets, which look exceedingly healthy; and buildings for the purposes of husbandry, consisting of a barn, stabling, and a cart-house, together with a capital new paved farm yard, have been erected since 1811, and form part of the moss farm, situated to the north.

It must be observed that some parts given in the plan, are, as yet, only in an unfinished state of cultivation; but I confidently trust that before the expiration of the two next years, the whole will have assumed the same altered appearance as that to which the annexed certificate bears testimony, and do equal credit to those who have hitherto had the executive superintendence and management thereof.

In an undertaking of such magnitude as that I have described, I am sure it will not escape the enlightened observation of the Society of Arts, that its accomplishment, as well with respect to harvesting the produce of the land, in its present state, as well as the earlier stages of progressive improvement, could not fail to have given constant occupation to a large class of labourers, artizans, and others, from which very considerable public benefit must have resulted; but more particularly so during the last Winter and Spring, when, on a monthly average, there were never less than from eighty to ninety employed; and that too, at a period when, from an almost total stagnation in every branch of trade, and consequent impossibility of obtaining work, the greatest distresses were experienced in this populous manufacturing district.

Thus, Sir, having endeavoured to put you in possession of all the information in my power to give, on the subject of the improvements made on a tract of uncultivated, useless waste, which, when the remaining seventeen acres and a half are completed will nearly amount to three hundred of excellent land, I respectfully take my leave, observing that, should my humble exertions to encourage and extend agricultural industry, as well as to furnish the means of employment to a large number of hands out of work, at a time of great national distress and suffering, obtain the favourable consideration and notice of the Society of Arts, it will afford me the highest gratification.

I am, Sir,
&c. &c. &c.
R. H. BRADSHAW.

Arthur Aikin, Esq.
Secretary &c. &c.

CERTIFICATE.

WE, whose names are hereunto subscribed, do certify, that we have viewed and thoroughly examined the lands, crops, and improvements, consisting of two hundred and ninety-four statute acres (of which the accompanying is a correct plan), forming part of an estate, called the Manor of Boothstown, situated within the township of Worsley, in the county palatine of Lancaster, the property of Robert Haldane Bradshaw, Esquire, of Worsley Hall, in the same county; and do declare, to the best of our judgment and belief, that the annexed is a true statement of the process used in bringing the moss or waste land in question into its present condition, of the expenses attending the improvement and cultivation of the same, as well as the produce of the late crops, and (though last, and what, in our opinion, should not be the least estimated) of the essential benefit that has accrued to the neighbourhood by the constant employment it has given to so many labourers and others, during the late period of general distress, and which, from a stagnation in trade, was so severely felt in this very populous manufacturing district.

Given under our hands, this first day of November, 1817.

JAMES WATKINSON, *one of his Majesty's Justices of the Peace for the county of Lancaster.*

ROBERT LANSDALE, *Churchwarden for the township of Worsley, in the Parish of Eccles.*

JOHN PICKUP, *Ditto Ditto.*

N° II.

BURNT CLAY.

The GOLD MEDAL *of the Society was this Session presented to the* REV. EDMUND CARTWRIGHT, *D. D. of Hollanden House, near Tonbridge, for his experiments on the efficacy of* BURNT CLAY, *as a Manure. The following communication was received from him on the subject.*

SIR;

I OFFER myself a candidate for the premium, No. 46, to be given by your Society, under the head *Manures.*

For some years past, I have been in the practice of using soot and wood-ashes, as top-dressings, but never to much extent, from the difficulty of procuring them in any considerable quantity. In the Spring of this year (1819) I was enabled to obtain soot sufficient to top-dress between five and six acres; part pasture and part arable, after the rate of 50 bushels per acre; and wood-ashes sufficient for the same quantity of ground, after the rate of 100 bushels per acre. The prime cost of the soot was 9*d.* per bushel. But as I had to fetch it from some distance, I calculate the price of it, when brought home, at 1*s.* per bushel. The wood-ashes were 4½*d.* per bushel; but as they lay nearer home, I reckon the carriage at 1½*d.* per bushel. The expense, therefore, of top-dressing with each of these articles, was the same, namely 2*l.* 10*s.* per acre. The object of my experiment this year was, to compare burned clay, soot, and wood-ashes. With burned clay I top-dressed about seven acres, after the rate of 20 cart-loads per acre, each cart-load being about 20 bushels. I must here observe that when I first began the burning of clay, I found it a very difficult and expensive business: but I have latterly contrived a method of performing the operation at a very cheap rate. It does not now cost me more than 9*d.* per cart-load, fuel included, provided the weather is not unfavourable. So that the expense of this manure does not exceed 15*s.* per acre.

The soil on which these top-dressings were applied, was a cold, wet, tenacious clay. The crops on which they were tried, were Swedish turnips, the common turnip, kohlrabi, turnip-rooted cabbage, potatoes, mangel-wurzel, barley and beans.

On the 15th September, I measured off 50 square yards of Swedish turnips, under each top-dressing, and 50 square yards, which had not been top-dressed. Their respective weights were as follows:

		ton.	*cwt.*	*lb.*
Burned clay	580 lb. per acre	25	2	20
Soot	546	23	12	2
Wood-ashes	398	16	12	52
No top-dressing	235	10	3	12

Laying the value of the turnips at only 5*s.* per ton (and they certainly are worth more) the burned clay exceeds the soot in value of crop per acre 7*s.* 6*d.*, by saving in prime cost 1*l.* 15*s.* total 2*l.* 2*s.* 6*d.* The superiority of burned clay over wood-ashes, is nearly 8½*d.*, to the value of which, if the saving in prime cost is added, the superiority will be 3*l.* 17*s.* 6*d.*

The superiority of burned clay over that which had no top-dressing, will, in money (deducting the expense of burning the clay) be 4*l.* 7*s* 6*d.*

I must here observe that the great disparity between the turnips which were top-dressed, and those which were not, must not be attributed altogether to the fertilizing properties of the substances employed, but in a considerable degree to the protection they afforded the young plants from the depredation of the fly. This will appear by the subsequent experiments on the kholrabi, and the common turnip. The kohlrabi plants, destroyed by the fly, were re-placed from a seed-bed. As the transplanting was performed in a showery time, none of them failed. The common turnip was sown during the same favourable weather, and escaped the fly altogether.

On the seventh of October, I measured off 50 square yards of potatoes, top-dressed, with burned clay, &c. &c. The results were as follow:

	bush.	*pecks.*		*bushels.*
Burned clay	5	0	per acre	480
Soot	4	3		456
Wood-ashes	4	2		432
No top-dressing	4	0		340

On the fourth of November, the results of similar experiments on kohlrabi were as follow:

	lb.		*ton.*	*cwt.*	*lb.*
Burned clay	160	per acre	6	17	26
Soot	138		3	18	32
Wood-ashes	114		4	17	30
No top-dressing	93		4	7	48

In my experiments on Reynold's turnip-rooted cabbage, and on mangel wurzel, I was completely defeated: in the one case, the seed, which I had had by me for many years, had out-lived its power of vegetating; and in the other case (the mangel-wurzel), it had never acquired that power; the cold wet season of last Summer not suffering it to ripen.

Having only half an acre of barley, I divided it into four equal parts. Not having conveniency in my small barn to keep the produce of each by itself, I kept an account of the number of sheaves that each part produced. When the whole was threshed out, I divided the grain that it yielded, which amounted to two quarters, into four parts, proportionate to the number of sheaves reaped from each division.

	sheaves.	*b.*	*pks.*	*qr.*	*b.*
Burned clay	126	4	2 per acre	4	4
Soot	121 more than	4	1 rather more than	4	2
Wood ashes	117 less than	4	1 rather less than	4	2
No top dressing	84	3	0	3	0

It must be observed that the barley was sown in alternate rows with beans, so that, in fact, the space occupied by the barley ought not to be reckoned more than a quarter of an acre, as one half of the ground produced a crop of beans. Of the result of the experiment on the beans, I am not able to speak, as they unluckily, when put into the barn, got intermixed with others.

November the 7th. The result of the experiment with common turnip was as follows:

	lb.		*ton.*	*cwt.*	*lb.*
Burned clay	296	per acre	6	7	54
Soot	292		6	5	36
Wood ashes	293		6	5	36
No top-dressing	276		5	16	76

Why the result of this last experiment should vary so much from the preceding ones I am at a loss to conjecture. Had I not paid the most minute personal attention to every individual part of the experiments from their commencement to the final measuring off and weighing the produce, I might suspect, indeed, that my directions had been deviated from or neglected, but as this could not possibly have been the case, the result of this last experiment must be set down as one of the many anomalies that are perpetually arising to baffle human ingenuity to account for.*

Of the experiments on grass land, I had no convenient way of judging, but by the eye. As far as the eye could decide, the burned clay was, without question, the superior; and the soot, as in all the other experiments, except the last, was evidently more powerful than the wood-ashes. It is singular that in the neighbourhood where I reside, the farmers hold soot in very light estimation, but have a very high opinion of wood ashes; an opinion which these experiments may tend to rectify. Burned clay, it will clearly appear by these diversified experiments, has the most decided advantage over the other two substances in every respect: its immediate effect is greater; its original cost is less, and in durability it admits not of a comparison. It is universally admitted, that wherever burned clay has been applied on a cold, wet, adhesive soil, it makes an immediate alteration in the texture of it, rendering it dry and friable, so as to admit of its being worked at almost all seasons. I gave a dressing of burned clay to a small piece of ground, between seven and eight years ago, the effect of which is visible to this day, and probably will be for some years to come.

---

* In a subsequent letter Dr. Cartwright thus expresses himself: I have never been more puzzled than to account for the results of the experiments on common turnip. I think, however, that I can now account for the whole. During the hop-picking season, this country swarms with gipseys and vagabonds of every description, who subsist chiefly on pillage. They last year, *in a single night*, carried off nearly 40 bushel of potatoes out of a field of mine. It is not unreasonable to suppose then, that my turnips suffered by their nightly depredations in the same way. As they would not draw them indiscriminately, but would select the forwardest, it is no wonder the theft was not suspected at the time, as the ground would still have a uniform appearance though half the crop was carried away. I am fully satisfied in this conjecture, and so is my bailiff. What confirms it is this: In two other fields, where I grew the same kind of turnip, the crops were uncommonly good, though the land upon which they grew was by no means equal to that which I appropriated to my experiments.

Burned clay has been used as manure in Ireland with the greatest success for at least a century past; has been introduced into Scotland with equal success within the last ten years; and it is now beginning to get footing in England, where, possibly, this paper, should it be sanctioned by the approbation of the Society of Arts, &c. may help to accelerate its adoption. As soon as it becomes universally established, we may date a new, and indeed, a brilliant era in the history and progress of British husbandry. This is not said at random, but from a confident persuasion, in which the opinions of some of our best agriculturists will bear me out, that the judicious application of burned clay, on soils to which it is adapted, will in a few years double their present value.

I am, Sir,
A. Aikin, Esq. &c. &c. &c.
Secretary, &c. &c. EDMUND CARTWRIGHT.

P. S. I herein inclose Certificates respecting the different experiments detailed in this paper, excepting what relate to the barley. As no account was taken and written down of the number of sheaves by any one but myself, and the reaper's recollection failing him, I have no other evidence to bring forward but my own memorandum.

CERTIFICATES.

THIS is to certify that I top-dressed in the course of last summer, 1817, nearly six acres, the greater part of which was arable, on Dr. Cartwright's farm at Hollanden, in the county of Kent, with soot, and the same quantity of ground with wood-ashes, of which upwards of two acres were arable, and about seven acres with burned clay, of which the greater part was arable. These top-dressings were laid on in the following proportions per acre, namely, of soot 50 bushels, of wood-ashes 100 bushels, and of burned clay 20 cart loads.

JOHN KING, *Carter to Dr. Cartwright.*

THIS is to certify that I measured off and weighed the produce of 50 square yards of Swedish turnips, of Kohlrabi and common turnips, of each respectively, top-dressed with burned clay, soot, and wood-ashes, and 50 square yards of each which had no top-dressing, and that the results, as stated in Dr. Cartwright's paper, which has been read to me, are correct.

JOSEPH BANHAM, *Bailiff to Dr. Cartwright.*

THIS is to certify that I took up and measured the potatoes, mentioned in Dr. Cartwright's paper, which has been read to me, and that the same is correct.

JAMES PAINE, *Gardener to Dr. Cartwright.*

SIR; Dec. 24th, 1818.

IT IS with great readiness I inform you of the improved method I have adopted of burning clay. When I first began, which is now three years ago, I followed such printed directions as I met with in different publications on the subject. I never, however, was able to accomplish my object but at an expense greater than what I could have purchased stable manure for. I determined, therefore, to try if I could not burn it at a cheaper rate. After a variety of experiments, which it would be useless to detail, I tried the following:—I had a trench made (having sufficient fall for taking off the water), about 20 feet long, three feet deep, and as many wide. At the upper end of the trench, and resting on its sides, a brick arch was turned, about 9 or 10 feet long, having openings for letting the fire through to the clay. These openings were made by leaving out half a brick at proper intervals. In the front of the arch is a strong wall two bricks thick; which has its foundation in the bottom of the trench. This wall, which is 2 feet wider than the arch, rises about a foot above it, through which there is a mouth to the arch about 2 feet wide. The whole erection will not require above 5 or 600 of brick, and no lime, except for the front wall. The arch will be best laid in loam or puddle of any kind.

In setting the kiln, care should be taken, especially at the commencement of the business, to lay the sods, or lumps of clay, hollow, that the fire may draw through freely. When the pile is about 2 feet thick upon the arch, the fire should be lighted, and a sod wall made round the kiln, which may extend about 2 feet wider than the arch, which will be supported in front by the brick wall. The sod wall need not be above 3 or 4 feet high. As the ignition proceeds, fresh clay must be added, still letting it lie as hollow as conveniently may be. When the heap is between 4 and 5 feet high, and burned through, the fire may be suffered to die out. Clay, however, may still be added for a day longer at least, and the more crumbly part of the clay may now be used. Two men at 2*s*. 6*d*. per day, and a boy at 6*d*. per day to attend the fire, in 2½ days burned 35 good cart loads, the fuel consumed was 175 furze faggots, at 5*s*. per hundred, the expense therefore stands thus:

	£.	s.	d.
Labour	0	14	9
Fuel	0	8	9
To which may be added a donkey and cart, two days	0	3	0
	£.1	6	6

I need not observe that the divisions of the arch, &c. are merely arbitrary. My farm being a very small one, small kilns answer my purpose. I mean to have two, that one may be at work while the other is cooling. I must further observe, that the consumption of fuel will of course be regulated by the state of the weather. Those who do not choose to go to the expense of a brick or stone arch, may make one of sod or spits of clay (but in this case they must be perfectly dry, or else they will not support the superincumbent weight). The centre for this kind of arch is thus made:—Lay four or five strong stakes across the trench, and upon these lay faggots in a circular form to build the arch upon. When the work is finished, the centre of faggots is set fire to. Though a trifling expense is thus saved in the first instance, a brick or stone arch will be found in the end the cheaper, as the clay arch must be renewed every time. A brick arch, if properly made, will no doubt last many years.

I am, Sir,
&c. &c. &c.
EDMUND CARTWRIGHT.

A. Aikin, Esq.
Secretary, &c. &c.

Nº III

FOREST TREES.

The GOLD MEDAL *of the Society was this Session presented to* SIR WATKIN WILLIAMS WYNN, BART. *M. P. of Wynnstay, Denbighshire, for planting* 845,500 FOREST TREES. *The following communication was received from him on the subject.*

Wynnstay,
SIR; March 7, 1818.

ENCLOSED I send you the particulars respecting a considerable plantation which I have made upon an allotment of mountain land, about three miles above Llangollen: should the Society deem it worthy of a premium, I shall feel myself much honoured thereby.

I am, Sir,
&c. &c. &c.
W. W. WYNN.

CERTIFICATES.

THIS is to certify, that Sir W. W. Wynn, bart. has planted one hundred and sixteen thousand five hundred and fifty oak trees, forty-seven thousand eight hundred ash, eleven thousand three hundred beech, sixty-five thousand seven hundred sycamore, nineteen thousand two hundred mountain elm, fifty-four thousand one hundred other elm, seventy thousand nine hundred birch, sixty-two thousand four hundred and fifty Spanish chesnut, one hundred and ninety-nine thousand three hundred and fifty larch-firs, one hundred and fourteen thousand one hundred Scotch firs, fifty-five thousand nine hundred and fifty spruce firs, nineteen thousand one hundred silver firs, nine thousand Italian poplars, two hundred and fifty mountain ash, two hundred and sixty willows, and one hundred laburnums, on part of his estate called Voel Eglwyseg, in the parish of Llangollen, in the county of Denbigh, between the 24th day of June 1814, and the 24th of June 1815, on such lands as are not calculated for the purposes of husbandry, in consequence of being too high, rocky, steep, and uneven, to admit of being ploughed, comprising the upper part of a conical mountain, and chiefly a northern, eastern, and western aspect.

The above plantation is well fenced on every side, partly with a skirting of enclosures, and partly with an excellent quick hedge, guarded till the plants reach maturity by a strong dry fence upwards of two feet high. The whole fence on every side is constantly attended to and kept in proper repair by a person whose sole business it is. The trees have not hitherto suffered any injury from sheep or other cattle, and appear healthy, and to thrive in a surprising manner, considering the high and greatly exposed situation they are planted in.

Witness our hands this 12th day of March 1817.

William Jones, *Minister of Llangollen, aforesaid.*

John Dawson, *Gardener and Planter.*

P.S. It is perhaps proper to state that beside the plantation above mentioned, Sir Watkin has planted in different other places in the same period, near one hundred thousand trees of different kinds.

John Dawson, *Gardener.*

I do hereby certify that the trees planted by Sir W. W. Wynn, bart. on part of his estate called the Voel, in the parish of Llangollen, in November and December 1814, and in January, February, March, and April following, of which a statement was transmitted to the Society of Arts, &c. last Spring, are in a thriving and healthy state.

John Dawson, *Planter.*

I take the liberty of stating that there were planted on the same mountain in November and December 1815, and in January, February, March and April following, 630,000 trees as per statement annexed, which are doing extremely well; viz.

Oak	80,000
Spanish chesnut	63,000
Spruce firs . .	102,000
Scotch do. . .	110,000
Larch do. . .	90,000
Wych elms . .	30,000
Mountain do. .	35,000
Ash	80,000
Sycamore . .	40,000
	630,000

John Dawson.

Wynnstay,
April 9, 1817.

SIR;

In reply to your request, I beg leave to state that the number of acres planted at Voel Eglwyseg, during the time mentioned in the certificate, were two hundred and six, 181 of which were planted in holes dug for the purpose, 15 inches wide, and 12 inches deep; the other part was planted by cutting two slits in this manner ⊢ and inserting the plant at the angle.

The trees planted on the former quantity were three years transplanted, and the latter one year, together with a few two-year-old seedlings. The situation from 12 to 1,400 feet above the level of the sea.

The expense of planting the larger quantity is estimated at 70*s*. per acre; the other part cost 10*s*. only per acre, and is much the best mode.

The trees planted on the upper part are three feet apart, and lower down five.

The mountain elm is not the wych elm, growing much taller, and having a narrower leaf, being much superior in quality, throwing out no large branches. For farther particulars respecting this useful variety, please to inquire of Mr. W. Malcolm, Nurseryman, Kensington, from whom part of them were purchased, and the remainder from Messrs. Dicksons and Brothers, Edinburgh.

I am, Sir,
&c. &c. &c.
WATKIN WILLIAMS WYNN.

N° IV.

FOREST TREES.

The SILVER MEDAL *of the Society was this Session presented to* RALPH CREYKE, *Esq. of Dotterill Park, near Beverley, Yorkshire, for planting thirty-four acres with* 164,560 FOREST TREES. *The following communication has been received on the subject.*

Beverley,
Jan. 27, 1818.

SIR;

I HAND you a certificate respecting the land I planted for Mr. Creyke at Dotterill and Kilham, in the year 1813.

The land planted upon Dotterill Wold in one belt, is 14 acres, containing 4,840 plants on each acre, two-thirds of which are larches, and the remaining third an equal proportion of ash, elm, Scotch and spruce firs, and were regularly filled up by me in 1814 and 1815. The land planted in Kilham East Field, by me, for Mr. Creyke, in 1813, contains 20 acres of 4,840 plants on each acre, two-thirds of which are larches, and the remaining third an equal proportion of ash, elm, beeches, oak, Scotch and spruce firs, and were also regularly filled up by me in 1814 and 1815, when both contracts were executed.

I am, Sir,
&c. &c. &c.
GEORGE TINDALL.

A. Aikin, Esq.
Secretary, &c. &c.

Kilham, in the East Riding of Yorkshire,
Jan. 24, 1818.

I, Richard Hopper, of Kilham, yeoman, certify that I know very well the plantation at Dotterill Park and Wold, in the said township, the property of Mr. Creyke, and planted by Mr. Tindall of Beverley, and that I have viewed the same within these few days, and that it is well fenced and protected, and that the trees are in a healthy and thriving state, and likely to be timber trees, and that the land upon which they are planted was open wold land, used for a sheep walk, and not proper for agricultural purposes.

Richard Hopper.

Kilham, in the East Riding of Yorkshire,
Jan. 24, 1818.

I, Richard Hopper, of Kilham, yeoman, certify that I know very well the plantation in the West Field at Kilham, the property of Mr. Creyke, and planted by Mr. Tindall of Beverley, and that I have viewed the same within these few days, that it is fenced and protected, and that the trees are in a healthy and thriving state, and likely to be timber trees, and that the land upon which they are planted was open wold land, used for a sheep walk, and not proper for agricultural purposes.

Richard Hopper.

N° V.

TURNIP SOWER.

The SILVER MEDAL *of the Society, and* TEN GUINEAS *were this Session presented to Mr.* JOHN COMMON, *of Denwick, near Alnwick, Northumberland, for a* DOUBLE-DRILL TURNIP-SOWER *of his invention. The following communications have been received on this subject.*

Denwick, near Alnwick.
May 7, 1818.

SIR;

I REQUEST that you will have the goodness to present to the Society for the Encouragement of Arts, Manufactures, and Commerce, the following description, and the accompanying model of an improved Double-drill Turnip-Sower of my construction. I invented it some time ago, and it has been used by many respectable gentlemen and farmers in Northumberland, who are ready to bear testimony to its great utility in turnip-sowing. Whatever countenance the Society may be pleased to bestow on this my invention, will be gratefully acknowledged by,

Sir,
&c. &c. &c.
JOHN COMMON.

A. Aikin, Esq.
Secretary, &c. &c.

It is acknowledged by experience, that even the single drill is very difficult to hold on the middle of the ridge, and at all times requires a most active and steady person to manage it. But where the land is any way rough, it is impossible for the most active to conduct a single drill properly, and the double-drill sowers which had been made prior to this improved one, are still more unmanageable than the former; for, being made all in a piece, and incapable of shifting of their own accord, where there is the least variation in the distance of the drills (a circumstance unavoidable by the most active and expert husbandman), the turnips are frequently sown on the side of the drills, instead of the middle, where they would receive the full nourishment of the manure; this circumstance must be obvious to every one who has walked through a turnip-field when fit for hoeing. It will be observed by the model, that this improvement completely obviates those difficulties, and thus contributes much to the excellence of the crop, each roller and sower being independent of each other, and shifting on the axle with the greatest ease, according to the variation of the drills. I trust that this explanation, imperfect as it is, will be sufficient to point out its superior utility and advantage, upon inspection of the model.

J. COMMON.

MR. COMMON; September 2, 1817.

I HAVE great satisfaction in communicating to you my opinion of the great utility of the Double Turnip-sower, which you sent me, and which I have had a complete trial of.

It is curious to see it work: how it extends, contracts, and applies itself, of its own accord, like some living creature, to drills of any distance, let them be ever so crooked or irregular, which defect is always the case in a greater or less degree, especially when unskilful ploughmen prevail, but which is completely remedied by your

Self-shifting Double Sower: by applying itself to the tops of the drills, it deposits the seed exactly on the dung, an advantage which cannot be so completely obtained by any double sower heretofore in use.

I am, Sir,
&c. &c. &c.
Robert Coward, *Farmer.*
Robert Gibson, *Farmer.*
Wm. Marshall.
John Embleton, *Farmer.*
Thomas Browne, *Farmer.*

Links House, near Morpeth, Northumberland, April 4, 1818.

SIR;

Having seen your letter to Mr. John Common, dated March 30, agreeably to your wishes expressed therein, I have to inform you that in the Spring of 1814 I got of Mr. Common one of his Self-shifting Double Turnip-sowers, which I have continued to use ever since, in preference to those on any other plan.

During which time I have sown 86 acres of turnips, and that I fully intend to continue using the same in preference to any other, as above stated; and that the implement deserves that publicity which the approbation of the Society will confer on it.

I am, Sir,
&c. &c. &c.
Robert Coward.

A. Aikin, Esq.
Secretary, &c. &c.

GENTLEMEN; Lesbury, 9th April, 1818.

Having signed Mr. Common's certificate respecting the utility of his Double-drill Turnip-sower, which I did from a conviction of its being superior to any instrument of the kind now in use in this neighbourhood, I beg to add, that having used it for the two last years, in which time I have sown upwards of sixty acres with it, I find that whatever shape the drills are, it invariably sows on the top or centre.

I am, Gentlemen,
&c. &c. &c.
JOHN EMBLETON.

SIR; Chillingham, 8th March, 1818.

UPON making inquiries respecting John Common's Turnip-drill, I find that he made the first of them about ten years since; it is therefore somewhat particular, that I should not have heard of it sooner, as Glendal Ward (in which I live) is by much the most extensive turnip district, and has larger farms on it than any other in the county, yet there is only one of those drills in it, and that was gotten only last year, by a young man beginning farming. The reason for this most probably is, that the plowmen in this county, as well as those in the adjoining counties of Scotland, set out the one-bout ridges at such exact, equal distances, that the two-row drills, which have been used here many years, deposit the seed exactly in the middle of the top of the one-bout ridges, and, of course, the farmers have not thought it necessary to get new and more expensive implements, as their old ones served all the purposes wanted. But in counties where this system of drilling turnips is only introducing, and where the ploughmen are not so accurate in setting out the ridges at equal distances, Mr. Common's drill, with two concave rollers moving laterally, I think, will be found very useful.

Mr Thomas Brown of Alnwick, a very ingenious mechanic, says, that he made one of them eight years since, on hearing that John Common had made one about two years before; and he believes that John Common was the first person who made them.

I am, Sir,
&c. &c. &c.
JOHN BAILEY.

Reference to the Engraving of Mr. COMMON'S *Double-Drill Turnip-Sower.*

PLATE 1, *a a*, shafts.

b b, handle.

c c, two concave rollers, which, from their particular form, always traverse along the top of the ridge *d d*. These rollers do not occupy the entire length of the axle, and, being loose on the same, readily traverse on one side or the other, in order to accommodate the occasional differences of distance between two adjacent ridges, and thus to enable the rollers continually to move along the top of the ridges.

e, fig. 2, a sheave attached to one of the rollers, and revolving on the same center with them.

f, fig. 2, 3, a sheave attached to the same spindle that carries the barrels *g*, fig. 3, which contain the seed.

h, a jack-chain passing over the sheaves *e* and *f*, and communicating the motion of the concave rollers to the seed-barrel.

i, a spout to receive the seed from the barrel, and to convey it into the drill formed by the cutters *k k*.

m, a cord passing across the handle, and fixed at each end to a frame *n*; hence, by raising the handle, the frame

Mr. John Commons, double-

Fig. 1.

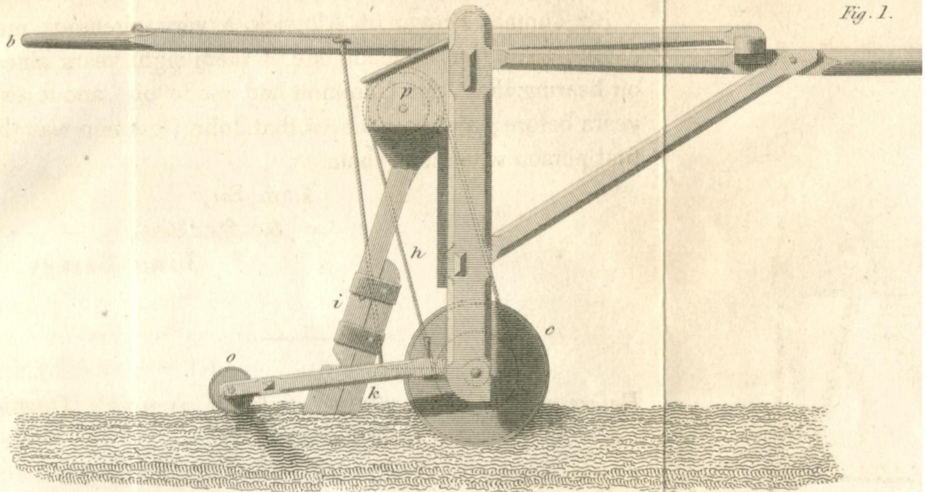
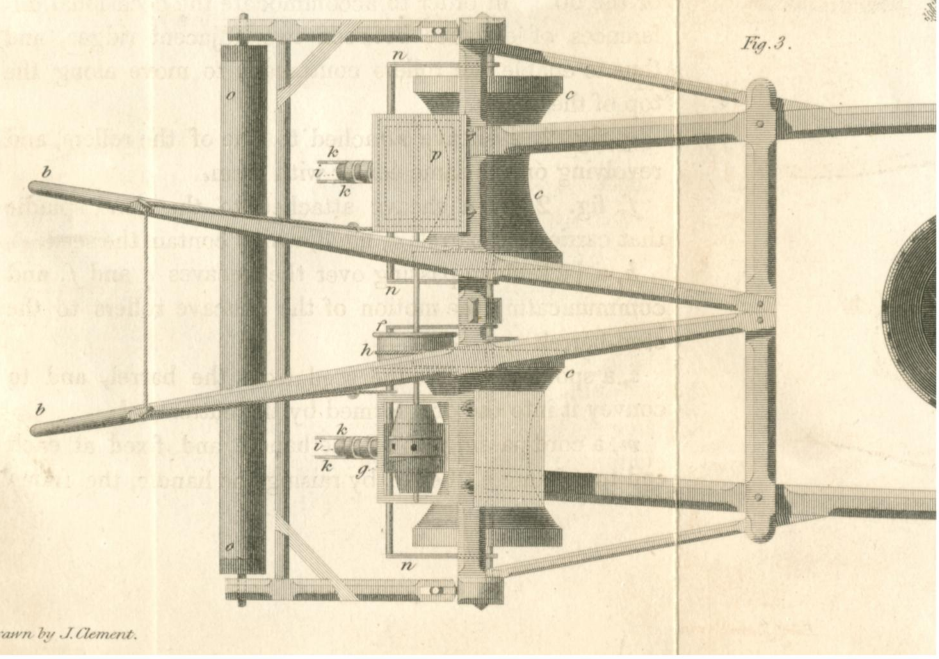


Fig. 3.



Drawn by J. Clement.

nons, double-drill Turnip sower.

Fig. 1.

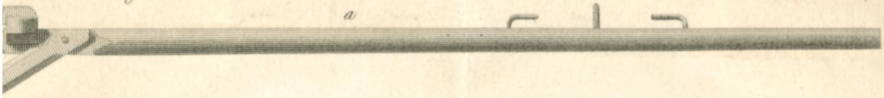


Fig. 2.

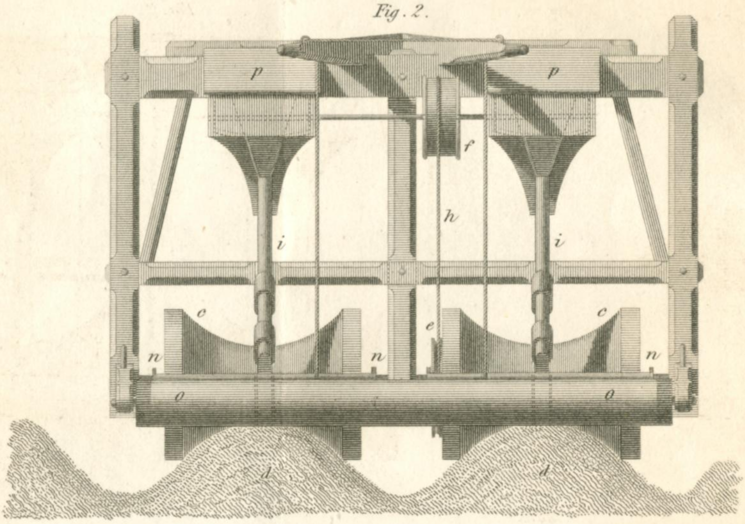


Fig. 3.

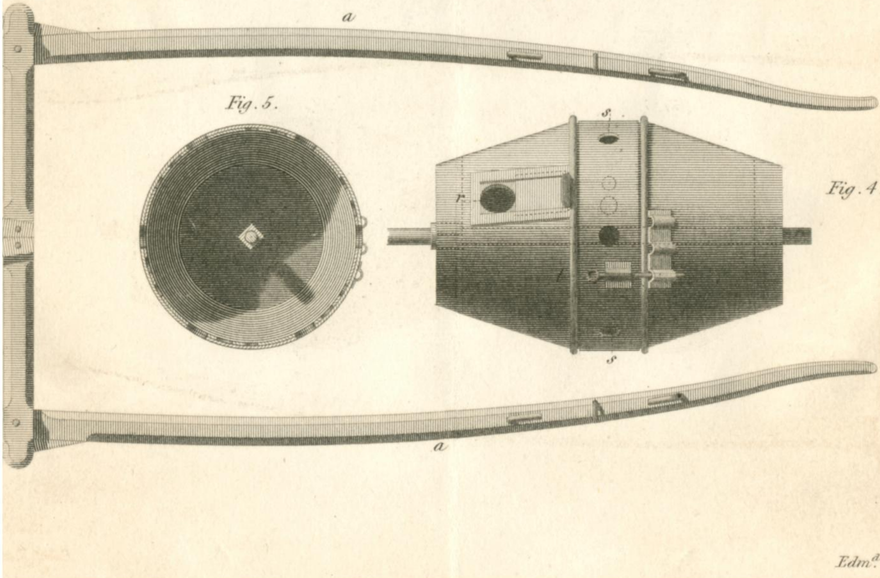


Fig. 5.

Fig. 4.

Edmd. Turrell Sculp.

is also raised, which last lifts the cutters out of the ground, and thus prevents them from being damaged, when the machine is turned from one furrow to another.

o o, a light cylindrical roller, to fill up the drills.

p, a box with a flap cover to contain the seed-barrel.

Fig. 4, the seed-barrel.

r, a hole, with a slide, through which the seed is poured into the barrel.

s s, a hoop, with eighteen holes in it, of three different sizes, corresponding with similar holes in the barrel through which the seed is delivered. This hoop is moveable, and by means of the pin *t*, may be fixed so as to leave uncovered either of the three sets of holes according as the seed is to be scattered near or more distant in the drills.

Fig. 5, a section of the seed-barrel, at right angles to its axis.

N° VI.

MANAGEMENT OF BEES.

The SILVER CERES MEDAL *of the Society was this Session voted to* ISAAC ESPINASSE, *Esq. of Chancery Lane, for his method of* MANAGING BEES. *The following communication was received from him on the subject, and Models of the Hives are preserved in the Society's Repository.*

Chancery Lane, Feb. 7, 1818.

THE cultivation of, and improvement in, the management of Bees, being one of those subjects of rural economy which the Society have thought worthy of their attention, and for the encouragement of which they have offered premiums, and they having at the same time signified that the claimant was expected to suggest his observations on the subject, I am induced (though engaged in very different pursuits), to offer the following Essay to their consideration. It is the result of experience, and of many years actual observation, not the speculation of a theorist, nor a compilation from the works of other authors on the same subject.

It is presented to the Society with no view to the pecuniary premium which they have offered, for did what I here submit to them give me any claim, or entitle me to such mark of their approbation, it should be restored to them as sought for with no other view, than to entitle me to have the honour of ranking among its members.

Conceiving that the views of the Society are not merely speculative, but directed to objects of practical improvement, I cannot but consider the number of publications respecting the generation of Bees, the prolific powers of the queen bee, the formation of their cells, and administration among themselves, as theories, ingenious and entertaining, but as in no wise tending to inform those who wish to keep this valuable insect, to make it most productive, or render it more generally useful. Several of these publications I have read, and the accounts in them of the different processes by glass hives, boxes, &c. the object of which is to save the bees, and take the honey, are open to these objections:—the descriptions in them are too complicated to be easily understood, and the necessary apparatus too expensive to be purchased, but by a few; and it must be recollected, that it is not from such, the supply of honey and wax necessary for our consumption is procured; as the number of those who indulge in these entertaining pursuits is small; it is the husbandman, the farmer, the gardener, and the cottager, who by small contributions furnish the necessary stock of wax and honey.

In offering, however, my observations to the Society, I feel considerable difficulty, as my opinions on the subject of their premiums are much at variance with theirs; they seem to consider, that he performs a meritorious service to the public, who points out the mode of increasing the number of hives, and of preserving the insect. If the object of the Society is, to increase the quantity of wax and honey necessary for consumption, nothing is more fallacious than to suppose that it is *necessarily* effected by offering a premium for the greatest number of hives, without reference to their weight; though the assertion may seem a paradox, that an increase of hives does not necessarily produce an increase of honey. It is easy to cover the apiary with hives; if one is allotted to every swarm, cast, or colt, the numbers may easily be multiplied, but the quantity of wax and honey is lessened, as I shall demonstrate to the Society in the course of these observations.

I am no stranger to that complaint so continually in the mouths of those who are unacquainted with the subject, the cruelty of taking the honey, by destroying the Bees. Their fate is pathetically lamented as if they alone of all the creation were to be exempt from their contribution to the support of man; while such persons walk through a market, and look into a slaughter-house without emotion, they weep over the apiary in the month of September. No one can better love the insect than I do, nor more exert himself to shelter, to save, and protect it; addressing myself therefore with due deference to the opinions of the Society, who have thought the preserving the lives of the insects an object meriting a premium at their hands, I avow it to be my opinion that I consider the speculation of saving the Bees, and at the same time taking the honey, as impracticable, as well as unnecessary.

It is unnecessary for no insect generates faster than the Bee; as I have ascertained from actual experience, that in three weeks after a swarm had been hived, not only were the combs formed, but full of the maggot, the infant state of the Bee, and the combs will be found so filled with progressive generation from the month of March until October.

That it is impracticable, this observation will show; there is a certain relation in nature between the animal to be fed and the pabulum necessary for its support. The earth throws out but a certain quantity of flowers, and all that it does, do not afford honey for bees. Their numbers therefore must be limited by the food necessary for their support, and to suffer them to increase *ad infinitum* would be to defeat its own object, for famine would soon destroy those whom a mistaken mercy had spared.* The profusion and variety of flowers necessary for them, is found in few parts of the kingdom where I have been. And that pastures are to be sought for, other than those which surround the apiary in the beginning of the season, and before their numbers have been increased by swarms, is demonstrably proved by what is mentioned in some authors on the subject; that in Piedmont and Savoy, the bee-masters bring their hives down the rivers on rafts, anchoring in different places, where flowers are found in abundance for their food. Is this necessary from any other cause than from the want of sufficient food at home?

In a treatise of this description, intended for the perusal and information only of persons of common minds, who have no capacity for experiment, nor means of trying its effects; who are satisfied with the animal as they find it, as well worthy of their care and attention for the value of its productions, as conducive to health and many of the most useful purposes, I put by all the systems which speculation has raised, and the theories in which ingenuity has indulged itself. Used to Bees from my childhood, and for the last eighteen years the proprietor of a large stock, which I have watched, observed, and studied, and having directed my observations only to increase them, as far as they could be kept, and having protected them from every thing that could injure them, I address the observations contained here, to enable those who have none, and who may be disposed to keep them, to have the benefit of my experience, and those who have to increase their produce. This object I propose through the medium of this honourable Society.

---

* I am led to this observation, from what passed within my own knowledge a few years since. In the village where my house is situated, many persons induced by my example procured bees; they were too numerous for what was to feed them; more than one half of them died in the ensuing winter; and nearly one-third of mine were saved, only by being fed.

I am aware that many of my observations will be found to be not entirely new, and equally so, that I shall have to controvert many received opinions, but I will state nothing which I have not tried, and for the effect and success of which I will not answer.

It requires no argument to establish the position, that where there is the greatest quantity of flowers, that is the situation best adapted for keeping Bees, but there are few where nature has not thrown out abundance. My house is situated in the village of Bexley in Kent; it is in the vale of Cray: Dartford heath is within a mile of it to the East, and Bexley heath two miles and a half to the North-west. I mention these matters with respect to situation, as heaths are supposed to be peculiarly productive of pabulum for the Bees, as affording in abundance the blossoms of the heath, furze, and wild thyme. The situation in that respect is a matter of primary consideration.

Those who are unacquainted with the insect, suppose that he possesses the fee simple of every flower, and that the whole regions of that description are devoted to his use. It is very far otherwise; and when poetry makes it light upon a rose and inhale its sweets, the truth is, that it never sucks it at all, or many other flowers; in fact, all whose cups are so deep, that its sucker cannot reach the bottom of it, where the honey is deposited. He, therefore, who wishes to keep Bees, must not rely upon every flower as furnishing support to his apiary; he must rely only on those which are shallow and small, or which expand widely in the leaves, so that the Bee can get to the bottom of the flower; neither must he rely wholly on the produce of the fields, meadows, pastures or heath but make his garden, or its borders, a separate plantation for such herbs and flowers as are fit for their use. For this purpose nothing I have found so grateful to the Bee, so easily propagated, so fruitful in produce of flowers, and so delightful in its flavour, as lemon thyme. It ornaments every part of my garden; and as it flowers in the beginning of August; and the honey derived from it is last deposited in the cells, it gives a flavour to all the honey which before had partially filled them:

> ——— redolentque thymo fragrantia mella.
>
> VIRGIL, GEORGIC 4.*

The common thyme, winter savoury, and mignionette, I have also found greedily sought after; and as they blow late, are therefore valuable.

In the garden, as affording food for Bees, I must much recommend large plantations of gooseberries, currant trees, and raspberries.

Few of the ornamental flowers of the garden, as the ranunculus, anemone, pink, or carnation afford any pabulum for the Bees; and as for the tulip, I am induced to think that it possesses some quality injurious to them, from the following circumstance: In the month of May, 1817, having gone down to my garden, when the tulips were in blow, and looking into the body of the flowers for those which were well coloured, I observed a dead bee in almost every one of them, and in some two. This led me to examine nearly the whole of my beds, and there was scarcely any flower which did not exhibit the same appearance.*

---

* I cannot help remarking here, that almost every observation in that delightful book, the Georgics of Virgil, I have found verified from my own experience.

The blossoms of the first-mentioned shrubs afford to them the earliest flowers, particularly the gooseberry; and the cupidity with which they suck them, presents the image of a sailor on his return tasting fresh meat and vegetables, who during a long voyage had fared on nothing but salt provisions. The blossom of the turnip is also very useful at that season of the year, as it furnishes both wax and honey in abundance.

I do not pretend to enumerate all the flowers which afford food to Bees, the general descriptions I have already given: those from which mine have principally drawn their support, are the white clover and the blossoms of the lime tree, and for wax, the blossoms of the furze and broom; it is the farina collected from these, that repairs the cells that have been tapped for their food during the winter: proximity therefore to these sources of support, is a very desirable circumstance in the formation of an apiary, the benefit of which I fully experienced in the course of the summer of 1816. The lime trees which usually blossomed about midsummer, did not fall into bloom in that year, until late in July; at Midsummer the old hives are preparing, or have just cast swarms, and the combs in the new are not in a fit state to receive the honey; but in the late season of 1816, when those trees went into blossom, in every hive the combs were formed, and were in a state to receive the honey from the flower. The beautiful and rich grove of Mount Mascal, near Bexley, composed entirely of lime trees, furnished pabulum for millions, and all the Bees which then left their hives, I observed in thousands to take that southerly direction which led to it; the consequence was, that all my hives which until that time were uncommonly light, from the effect of an unfavourable season, in a fortnight's time were amply filled with honey.

---

* From what cause this proceeded I have not been able to ascertain, unless from some deleterious substance which the insect might have imbibed from the flower; apprehending, however, that it might have been caused by the inability of the Bee to escape from the depth of the flower, I took a few bees from a hive, and put them into several very deep flowers, but they all got out, and flew away without any difficulty.

The next object, in order to increase and improve the apiary is, attention to the hives used, and the mode of hiving the swarms. There is no prejudice which I have had more to combat with, than the using of large hives, that is, the use of hives without any attention to the proportion they bear to the swarms to be put into them. In Kent they are partial to hives nearly two feet high, and as large in diameter: they seem to consider, that the hives cannot be too large, and that it is of no importance whether the loaded and wearied insect is to drag his burthen up two feet of the side of the hive, or one; or whether the hive is to be wholly, or only partially filled with comb; both are of the utmost importance. I have uniformly observed, that Bees never work well, unless the hive is full,* and when, after all their labour, they find it empty, it is cold and uncheering, and they work with no spirit. I therefore always endeavour to have a swarm fill the hive, when first hived, to within two or three rims at the bottom; and so necessary do I consider it to have the hive full of Bees before they begin to work, that I add to a small swarm either another, or a cast, and put two or three casts together, till a proper proportion of Bees is had; this is done with the greatest ease, by spreading a cloth on the ground, and striking the hive which contains the swarm to be added quickly and sharply on it, when the swarm will fall in a cluster on the cloth, and then quickly covering it with the hive, which is to be re-inforced with the addition, those on the cloth readily ascend, and fraternize without difficulty with the others; by these means a strong hive is formed, well filled with Bees, and they work with spirit; the hum of the many round the door, seems to rouse and cheer the rest; whereas, if the hive is weak of Bees, the want of vigour and spirit is visible. It is this circumstance which has induced me to offer that observation which I before made, respecting the number of hives of Bees, as making that a circumstance of reward; if every cast is hived, you have a numerous apiary, but I never had the good fortune to get an ounce-weight of honey out of a cast in July, which is the usual month for such swarms; I have, therefore, added them together, and often three into one hive, and they have worked cheerfully.

---

* In hiving the swarms, therefore, this must be attended to with particular care, that the hive be proportioned to the swarm; if it is too small, they will lie out in clusters on the board, and not work,

§

But the size and make of the hives is not the only matter to be attended to; the warmth arising from the thickness of the straw composing them, and the sweetness of it, are also deserving of much consideration. In all the hives which I have had in Kent, the rolls are thin and

---

having no place in which to deposit what they gather; if it is too large, and of course in great part unfilled, when the Bees come home they find the hive empty or cold, and work no longer with industry and spirit.

hard, and little attention is paid to the colour or sweetness of the straw; the consequence of which is, that they are cold in winter: I have, therefore, procured the hives which I use from Chelmsford, and Hertford, where the rolls are thick and not so hard, and the shape well proportioned and handsome. The shape which I prefer, is low, wide, and pointed at the top. Bees begin to work near the top of the hive, and work downwards; and as the combs approach the bottom, their labour is diminished. The board on which the hive is placed should be of well seasoned elm, of the thickness at least of an inch, as it will otherwise warp with the heat of the sun, and when every part of the bottom of the hive does not touch the board, vermin, such as ear-wigs, snails, &c. get in, and from the moment such unwelcome guests intrude into a hive, the Bees become discontented, and no longer apply themselves to work with vigour.

The bee-house is the next object of care. I consider mine as the best ornament of my garden; on an adjoining seat, most part of my day is spent in contemplating the activity and busy industry of these valuable insects; and in fact on the master of the bee-house being himself fond of the pursuit, great part of the success of keeping them depends: they must be watched during their time of swarming, and the attacks of their enemies must be warded off, for of these they have not a few. There are but two aspects in which the bee-house should be placed; the South, or some point towards it; and the East. I have in my principal apiary two houses, each containing eight hives; the one fronting the East, and the other the South; I have endeavoured to ascertain in which of them the Bees throve best, but in that respect I could find no difference. I however prefer the Southern aspect, as it enjoys the benefit of the Winter sun, whose warmth and effect in keeping the house dry, is of infinite consequence;

this leads me to the most decisive dictum on the subject, that it is essential to the thriving of Bees, that they should be kept sheltered from damps and wet, in Summer and in Winter; as, unless they are kept dry and warm, they will not work. Turn up an unsheltered hive on a rainy day, in the midst of Summer, a drousy hum announces their torpor; but if sheltered, so that the chilly effect of the rain has not reached the interior of it, the moment the atmosphere is cleared, and a glimpse of sunshine is seen, they will be observed to issue from their hives to work, as alert as if not a single drop of rain had fallen.

The absolute necessity of warmth during the Winter to the preservation of Bees is, independent of what has been already observed, the best answer that can be given to the possibility of taking the honey without destruction of the Bees. If the honey is taken, the combs must be taken too. What is the effect? The hive becomes empty; there is no exclusion of cold, from the circumstance of its being filled with combs: there is no resting place for the Bees, who are sheltered in the intervals, and some food is derived from the bee-bread and wax which is taken away. They do not live in Winter clustered as in a swarm, but are dispersed over the combs, and either feed on their appropriate cell, or what the combs contain. How, therefore, a swarm deprived of combs is to live in that cold, inactive, and unprotected state, I cannot conceive! Without food they cannot exist; the quantum to be administered, is not easily ascertained, and it is attended with much trouble; and though we well know that ingenious glass appendages have been filled with combs, such as the shop of Mr. Wildman exhibits, how is the cottager to procure this costly apparatus, and how to attend to it? for except by such means, ingenuity has never suggested any mode, nor speculation glanced at its practicability. If you mean to carry your hives through the winter, you must give them their natural comfort and support; you must leave them their combs and their hives, and liberty to follow that mode of living which nature has pointed out to them.

Every bee-house should therefore be constructed of sufficient depth, that the hives may be brought forward, or pushed back, as the weather serves. In summer they cannot be brought too far into the light and heat, which rouses them into life, and stimulates their industry; nor in Winter be too far removed from the external wet and cold.

My two bee-houses are sheltered on every side by hedges, except towards the South and East. The hedges to the North and North-east are beech, which are kept closely clipped. No trees should be planted in the front, as that keeps off the sun, whose light and warmth are the great stimulants to their working. Six hives are, in my opinion, enough for each house, and the houses should stand at some distance from each other; the reason is, that when the Bees swarm, the buzz of those which rise first, is apt to induce the other hives to swarm also, and two good swarms often unite; but when they do so, they should be put into a hive proportionably large. The bee-house opens by folding doors at the back, by which every hive can be easily got at for any purpose required; the places in the front being made too narrow for a hive to be taken out there; the back may be secured from thieves by locking, or nailing up the doors during the winter: the floors should be made accurately level, for the purpose of feeding the Bees, if necessary

To the construction of the bee-house it is indispensable, that free access should be at all times had to the hives, to take them out when necessary. For this purpose, the doors at the back of the bee-house should open, whether it be to take them in Autumn, to weigh them at that time, to ascertain their ability to support themselves during the Winter, to plaster them to the board to exclude the cold or wet, or to destroy any vermin that may be lodged in the house, or under their boards, all which matters must be attended to. Previous to shutting up the bee-houses for the Winter, the hives should all be taken out, and the whole interior carefully swept, when infalliby there will be found a plentiful collection of those insects whom the approach of Winter drives into their hiding places, and who seek for shelter in every cranny of the bee-house; snails, earwigs, and spiders are of this description; and that mice will also seek for shelter in the same place, and in the hive itself, I had this demonstrable proof.

On leaving the country in October 1809, among others, I left my oldest hive of considerable strength. In the beginning of the Spring, I observed but few Bees come out to work, and a general torpor seemed to pervade it; on turning it up, having before just lifted it on one or two occasions, I observed one half of the hive filled with beech-leaves (a beech-hedge forms one side of my apiary); upon examining it I found that the back of the hive had projected beyond the board, through which a mouse had entered: the Bees had retired to one side of the hive, and he had taken up his Winter quarters in the other. He had made his nest with the decayed beech-leaves, and he and the Bees had lived joint-tenants of the hive during the whole season. I removed the broken combs, and all the remains of his dwelling; the Bees seemed to recover new life; the hive was restored, and though it did not swarm the succeeding year, it became one of my best, and continued so for many years after.

Birds will be found enumerated in every publication on the subject of Bees, as their enemies; but I have found that there are but few birds destructive to the apiary; most of those which are so represented I have found are those who come to feed on the dead Bees or maggots, which are thrown out from the hives, and though the swallow

> "————Procne, manibus signata cruentis,"
> VIRGIL,

is reckoned among the chief, I have observed that the most destructive is the bird called the house lark, a small ash-coloured bird, of the size of a tit-lark, and next to it, the tom-tit; these should, therefore, be destroyed whenever they present themselves where Bees are kept.

Of the insect tribe, there are many inimical to Bees; of these the moth is the most deadly; these insects are among the smallest of the genus, and are of a light whitish brown; they are remarkably active in their motions, and are seen running with great quickness round the hive, watching their opportunity to enter, which, when permitted to do in any number, the combs become the depository of their eggs; the top is filled with silky film; the bees are expelled; and the combs, when torn, resemble paper: these should be carefully watched and destroyed whenever they appear, for when once they enter a hive and breed, the loss of the hive is inevitable.* Spiders also, though but in a small degree destructive, interfere much with, and obstruct the working of the Bees without, by drawing their webs across the recesses of the apiary; this is however in Summer and Autumn only. They are very easily destroyed, by going out at night with a candle, at which time only they are visible on their webs in the centre of them, and are easily taken by the hand and destroyed. These are the insects which Virgil points out—

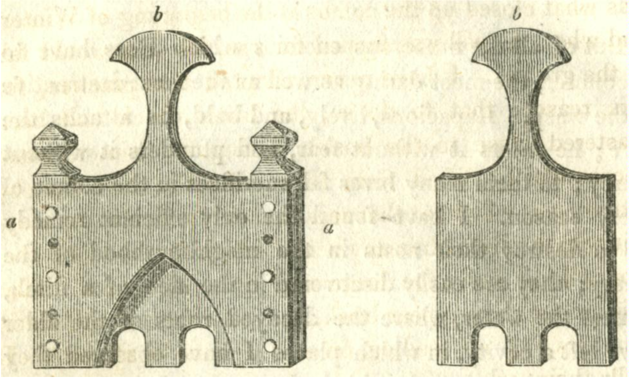
---

* Mr. Mills, in his treatise published by order of the Society, says, "the moths break the combs to pieces!" He could never have seen a hive which the moth had attacked: they are the feeblest of all insects, and incapable of breaking the combs; the effect of the attack of the moth is as I have described it. I never had but one so destroyed; but such is my opinion of the certain and destructive effect of the moth in hives, that it is sufficient for me to condemn a hive, and take it in the ensuing Autumn, from which I have occasionally seen a moth come out, or into which this insect has entered.

> ——dirum tineæ genus, aut invisa Minervæ
> Laxos in foribus supendit aranea casses.
> VIRG. GEORG. 4.

But of all the numerous enemies which Bees have to encounter, the most daring as well as the most destructive is the wasp. Rapacious, lively, and bold, he attacks the hive; he enters it without fear, and plunders it without mercy; to them many hives fall sacrifices in the course of every season. I have found the only efficient remedy is, to destroy their nests in the neighbourhood of the apiary; they are easily discovered in the side of a ditch, or near the water, where the decayed roots of the alder have left a cavity, in which places I have observed they much delight to breed; this is done at night, when they have all returned to their nests, by putting port-fire into their holes, or by burning straw on them; their nests, however, are not discovered until they have become numerous, and so attract observation by their flight, directed in numbers to a particular place; and before they are so discovered, they commit great and destructive devastation among the hives. I have uniformly closed the entrance of my hives by the means pointed out in the following drawing, where the Bees enter the hive by two small doors, sufficient only to admit a single Bee at a time.

After trying the common experiments of hanging up bottles of honey or sweet liquor near the hives, I found I lost as many Bees in those as I destroyed wasps, and it therefore occurred to me, that the best mode of securing the hives would be to narrow the doors while the wasps were out, or on the wing, by some expedient which at other times would allow the Bees their full scope of exit and entrance. The following is my invention, and it has answered admirably, not for the purpose only of enabling the Bees to defend themselves from the wasps, but to shut them up during the Autumn and Winter; during the Autumn, to keep out the vermin, and in Winter to keep them warm,* yet give them air. This I put on the hives early in August, as I by these means can give them more or less room to work, at the same time that I thereby exclude the entrance of every insect whatever; and to this early closing up the doors, but with a power at the same time of giving them full liberty to go out in any number, by lifting the slide, I attribute much of my success in the preservation of my stock hives, as their stores are left untouched, and they are kept dry, and all offensive insects, such as snails, moths, &c. are thus excluded.



---

* The drawing *a a*, represents two small pieces of wood about an inch and half long, about the sixth part of an inch broad, and of the same thickness; there is a groove in each, to receive a sliding piece of board *b*, about an inch and ½ wide, in which are cut two small doors, wide enough to admit one bee at a time only. The pieces of wood *a*, are fixed on each side of the door cut in the hive itself, and fastened to the hive by two large pins; the piece of wood *b*, is then fixed in the two grooves, and is raised or put down at pleasure.

There are four periods or seasons at which Bees are to be particularly attended to. The first I consider to commence from the earliest bloom of the willow, and blossom of the gooseberry. It has been recommended at this time to lift the hive, and sweep the board, as the floor of the stool will be found covered with the dross of wax, which was what closed up the combs at the beginning of Winter, and when the cell was tapped for use, the wax would fall to the ground. I have never adopted that practice, for this reason, that to do so, the hives which had been plastered close to the boards during the winter, must necessarily be lifted from them, and the cold thereby introduced, which, at that season, I think would do more injury to the Bees, than any benefit which they would derive from taking away the loose wax from the board. If at this season they appear brisk, and issue from their hive in numbers, let no feeding on any account be allowed. It dulls their early activity and industry by their finding at home what they would otherwise gain abroad; and the honey drawn from the flower gives them a more healthful activity than they could have from any feeding; but if a hive is observed when struck, to emit a dull and heavy buzz, and if the Bees do not issue in any numbers, it may be of service to feed them, but scantily, and merely to give them strength to go abroad. From this time, until the period of swarming, they require some little attention; if the season is open, dry, and mild, in fact none; but if May should be wet and cold after the first swarms are cast, so that they cannot work, they must be attended to and fed, as they have no support from within, or they will perish.*

During the Summer the only attention requisite is to watch the hives which show any indication of swarming, to take care that none go off.

---

* In the last year I had a swarm on the 17th of May; soon after, the weather became very unfavourable, and continually wet. I was obliged to feed them for a fortnight; very many died, but the survivors repaid my care, and when the weather cleared up began to work. At the end of the season, they gave me a hive of near thirty pounds weight.

As I do not profess to give full and perfect directions as to every matter connected with the hiving of the Bees, I content myself with recommending it as essential to the hiving of good stocks of Bees that the swarm, when hived, should nearly fill it, and if it does not, to add to it another swarm or cast, so that it shall fill it; the reason for which I have already given.

I now come to the season when the honey is to be taken, a task never undertaken without reluctance, nor executed without regret. When from the failure of the flowers, little or no addition is made to the stock of the hive in wax or in honey, and I calculate on none after the middle of August, having ascertained, from observation, that to be the fact, I consider that that is the proper period to take those hives which are too weak to get through the winter. This only reconciles us to the taking of them, for if not then done, a slow and lingering death by famine awaits them, their industry not having given them provisions for the season. I therefore begin to take my hives in the middle of August, by which means the honey runs more readily from the combs; the refuse, when thrown out, affords food for the Bees who remain, and there are fewer competitors for whatever pabulum the Autumn flowers afford.

The honey when taken, in order to be pure, fragrant, and well flavoured, must be such as flows spontaneously from the comb, cut into a hair sieve transversely when the hive is taken; left to flow through the sieve into a vessel beneath, and never squeezed, or the running of it forced by heat, and after it has so flowed through the hair sieve, it should be again strained through a finer one, so that not a particle of wax should mix with it, which creates a fermentation, and spoils the honey.

Honey, however, so prepared, by flowing from the combs, always becomes saccharine, but if the hive itself is kept, and the combs taken out as wanted, the beautiful and transparent honey will preserve its clearness, purity, and sweetness for at least a year.

I have until the last season, which was so unusually late, always considered, that Bees add little to their store after the first or second week in August; at this period, therefore, and for the ensuing month, much attention is required, to protect for them what they have acquired, as well from the depredations of wasps, the most destructive plunderers of their stores, as from the spoliation of each other. When an old hive has the unconsumed honey of former years in any quantity, in addition to what the present year has given, and the number of Bees is small, it is astonishing to observe how soon the weakness is discovered, and that hive is marked out as a prey to its neighbours.

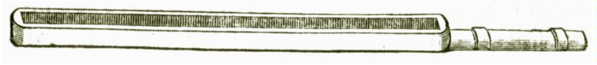
The constant buzz that is round it, caused by Bees flitting round the door, and on their attempting to light being attacked by those on the stool, who are guarding their magazine, is an infallible sign and direction, that that hive is marked for plunder. On these occasions I have closed up the door to a very small entrance, and I have covered the front with a cloth; it has given only a temporary suspension to complete pillage, for nothing will save it or deter its assailants from their object. The hive is attacked by numbers, overpowered, and all their honey taken and carried away. Finding, therefore, the absolute impossibility of saving from the pillage of its neighbours, a hive rich in honey, but poor in Bees, and unequal to its defence when its weakness is discovered; I uniformly take it, considering that it may be useful, and save other hives which I might be disposed to take, from a mere trial of their weight, but in which the number of Bees was considerably larger.

I am now arrived at the last period of my tract, but not the least important, the judgment to be pronounced on such as are to be kept for stock hives; either relying on their acquired stock of honey, or such as are to be brought through the Winter by means of feeding, and what is necessary for bringing them through that season; on this much depends; but whatever hives are selected for that purpose, they should be closely plastered with lime to the stool; this contributes to their warmth, to the exclusion of vermin and insects, and if any water falls on the board, it does not reach the hive, which would otherwise become rotten and damp at the bottom; but when plastered round and up to the door, there is no entrance but through the two nicks in the slider. The front of the bee-house should be covered with board or oil-cloth, the hives pushed back, whereby they become darkened, and the bees less disposed to go abroad in Winter. If the number of hives is so great, that any given number may be selected, that selection depends on the weight of the hive, and the heaviest should be kept for stock, taking care, however, not to be decided by it only, but to endeavour to ascertain whether they are also strong in numbers: this can be known from having observed them out at work in Autumn, or by throwing the loose combs of the taken hives from whence the honey has flowed on the grass before the bee-house, from whence they will issue in great numbers to suck the refuse honey remaining in the combs, and they may be then watched on their return to the hive, and their numbers calculated. This attention to the number of Bees, as well as to the weight of the hive, is a matter of observation indispensably necessary, and on which every thing depends. It often happens that a hive heavy in honey has overswarmed itself, and the number remaining in the hive is small, such is perfectly unfit to be carried through the Winter. I have always weighed my hives at the close of Autumn, not by guess, but accurately by the scale and weights; I weigh them with the board on which they stand, having before ascertained pretty nearly the weight of the stand. If the hive weighs twenty-five pounds, it will safely get through the Winter without feeding; I have had some have gone through it which weighed twenty-two or twenty-three pounds only; but upon these without feeding, I cannot absolutely decide on their abilities to pass the months of Winter and the early part of the Spring. But with the aid of feeding, it is perfectly easy to bring any hive through the Winter. And here I beg leave to give the most decided contradiction to any author who has treated it as an idle, useless, and almost impossible expedient to save such a hive during the season. Many have done so, and many such assertions I have often heard made, but from which I totally dissent, and from repeated experience am enabled to contradict them. I have had many supported by these means during nearly the whole Winter, and those at the ensuing season have thriven out of measure, and become my best for the ensuing year.

It frequently happens, that in a late and wet season, the swarms come out in the latter part of June, and also numerous, strong, and large casts of the same description; they have not time to complete their store of combs and honey, but they are valuable for their numbers and their future promise; their industry only enables them to half fill their hives, and gather a support for a few Winter months. Nothing is of more facility than to bring those hives through the Winter by feeding, and when that is done, the remaining half of the hive is filled early in the succeeding year, and though they probably will not swarm, from having their hive to fill with combs, as well as honey, I have always found the quantity of the latter to be considerable, and the number of Bees great in proportion; their attention is undiverted by throwing out swarms; their brood is employed at home, in what, if hived in a new dwelling, they would be called upon to do, filling it with comb as well as with honey.

For the effect of this I can answer. It has been done by me repeatedly for many years back, particularly at the commencement of this my favourite pursuit; and so far am I from thinking the feeding of Bees to be a useless and unavailing attempt, that I have, without deviation, year after year adopted it, beginning the feeding earlier or later according to the weight or strength of the hives when they were put up in October. Having ascertained their relative weights, I calculate from them how long their stock of honey will last them, and their feeding is commenced accordingly. My whole stock is numbered 1, 2, 3, 4, &c. and on coming to town, I leave with my servant instructions in this way: for example, No. 1, to be fed at Christmas; No. 2, the middle of January; No. 3, the latter end of February; No. 4, need not be fed, as I consider it to be strong enough to get through the Winter without assistance.

A decided advocate, therefore, for feeding Bees during the Winter, and having ascertained the utility and advantage, as well as the mode of putting it in practice, I communicate my method, as I have successfully pursued it. The composition which I give to my Bees is moist sugar and sweet beer, boiled to the consistence of treacle; it is inserted into the hive in a small trough or scoop made of wood, hollow, and of this shape.



This is to be filled daily. To insert it into the hive through the front door, would be to bring the Bees of all the adjoining hives to share it, and to engage them in fight and destruction: my bee-house, opening wholly at the back, I cut a hole large enough to admit the trough at the back part of the hive; and when the trough is inverted I shut the outside doors quickly: thus no Bees of the adjoining hives are roused; and the hive fed, enjoys the whole of what is given to it: the only attention required on the occasion is, to take care that the board or stool of the hive is perfectly level, least the food should be spilt, which would take place, if the board was higher either in the front or back part of the hive.

It is a received opinion among the common people, that no hive should be suffered to stand longer than three years, for it will certainly die in the fourth, or be good for nothing. No opinion can be more erroneous: I last year took a hive which had stood fourteen years, which I kept for the sake of the experiment, and which gave me a swarm the last season; but having cast a swarm last year, I found the number of Bees so reduced, and the hive so light, that it was impossible it could get through the Winter, and I therefore unwillingly took it.

I shall now conclude what I have the honour to offer to the Society with this observation, that the reward which the Society offers, either pecuniary or honorary, should be held out to him who produces the hive of given dimensions, of the greatest weight, and of course containing the greatest quantity of honey and wax. To give to him whose pretensions are the number and not the weight of the hives, is to enable any one to practise a fraud on the Society, whose object is, to hold out encouragement to the production of the greatest quantity of wax and honey, by inducing him to hive as a distinct stock, every late small swarm or cast, not one of which I have ever found yield the smallest quantity of honey fit for any purpose whatever.

I declare to the Society, that I was possessed of fifty-six stocks of Bees, previous to my beginning to take them in August last, 1817, all of which were composed of my old stock of the preceding year, and of swarms from them in the year 1817. My stock of the year 1816 consisted of 52 hives, 24 of which I carried through the winter without the loss of one, having taken the rest. From the 24 hives I had upward of 40 swarms and casts, which were hived in 32 hives.

Isaac Espinasse.